

Vegetable Disease Control and the Impact of Soil Health Management Practices

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Most vegetable crops grown in New York are impacted by several root diseases and often resulting in significant reduction in marketable yield and/or quality. General symptoms of severe incidence and damage by root disease pathogens include poor emergence and stand establishment, damping-off of young seedlings, uneven growth, yellowing of primarily lower leaves, premature death of severely infected plants, and lower marketable yield and quality. Roots of severely infected plants are generally reduced in size and may exhibit various stages of decay as well as diagnostic lesions and discolorations that are characteristic of the involved pathogen(s). Among the major pathogens of vegetables grown in New York are *Rhizoctonia solani*, *Pythium ultimum*, *Thielaviopsis basicola*, various host races of *Fusarium solani* and *Fusarium oxysporum*, the club root pathogen, the lesion, root-knot and bloat nematodes and several other pathogens. These pathogens are capable of serious damage individually on susceptible crops, but often occur in different combinations with other pathogens or background soil organisms, resulting in disease complexes with increased severity and damage.

Damage caused by root disease pathogens is greatest in poor quality soils. Thus, improving soil health status will directly or indirectly improve root health and reduce damage of root pathogens. It has been shown that assessing root health is a highly correlated biological indicator of soil health in general. Roots growing in healthy soils generally are of larger size, firm, have large numbers of fibrous rootlets, penetrate deeper into the soil profile, and exhibit limited or no symptoms of infections by root pathogens. Such roots are more tolerant to environmental stress conditions and more efficient in absorbing water and nutrients. In addition, it is known that all soil health management practices (various modifications of tillage systems, cropping sequences, cover crops and soil amendments) directly or indirectly affect the populations or root pathogens and their damage to vegetable crops.

The first step in the effective management of root diseases is an accurate identification of the root pathogen(s) involved in the target disease and crop. Root pathogens have diverse biology, host ranges, and sensitivity to biological and chemical control products. Currently, management of root diseases in general is possible only through the use of a combination of compatible control options and employing IPM strategies (Soil-IPM). Obviously, it is critical to prevent the introduction of root pathogens into clean vegetable fields, whenever possible by employing good production practices. Available management options against root pathogens of vegetables include 1) the use of high quality and pathogen-free seeds, and with an effective seed treatment, 2) limited number of soil treatment products are available and effective against root pathogens, 3) selecting tolerant varieties that perform well under severe root disease pressure, 4) practicing an appropriate cropping sequences (rotation and cover crops), and 5) improving soil health status by appropriate and sustainable soil management practices. A number of these

control options will be illustrated during the presentation at the meeting including the reaction and performance of pea varieties in soils heavily infested with root pathogens (Figure 1), use of fungicides as seed and soil treatments against table beet diseases (Figure 2), and the effect of crop rotation, cover crops and other soil health against root diseases of beans and other crops (figure 3).

Figure 1. Root rot development on roots of selected pea varieties grown in a field soil heavily infested with root pathogens.



Figure 2. Symptoms of root and pocket rot disease symptoms on table beets.



Figure 3. Snap bean growing in the reduce tillage plots at the Soil health Site at Gates Farm, NYSAES, 2011.

